

Message

From: Schwier, Allison N [SchwierAN@state.gov]
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To: Schwier, Allison N [SchwierAN@state.gov]
CC: Wong, Gifford J [WongG@state.gov]
Subject: China Energy and Environment News 11-1-2017
Attachments: FW: Bluetech Award was Selected by Beijing as Documentary Subject to Celebrate China's 19th CPC National Congress; China environment news October 23 - 29 - our weekly story picks; Monthly Update: Publications, Events, and News; [UPDATED] Invitation: 11/14 - "China's Power: Up for Debate" ; China Energy and Environment News 11-1.docx

All,

Happy Wednesday and first day of November! Starting the 2-day artificial intelligence (AI)-palooza, with a slew of articles and link to a podcast as well. Hoping to have part 2 to you tomorrow, and we'll round out the week with some random articles.

Attached:

- **Bluetech award notice** – includes a video on clean air technology
- **Chinadialogue** – environmental progress at NPC, pollution, coal, green power
- **NBR – analysis of the 19th NPC**
- **Interesting event at CSIS on November 14 “China's Power: Up for Debate”**

Til tomorrow,
Allie

AI

- **China's Plan for World Domination in AI Isn't So Crazy After All**
- **China introduces pioneer AI Challengers' Games**
- **Baidu's VP Wang Haifeng now leads Baidu Research Institute to further develop its AI application for commercial use**
- **The Great US-China Biotechnology and Artificial Intelligence Race**
- **Govt set to give AI sector huge policy boost**
- **China, Russia and the US Are in an Artificial Intelligence Arms Race**
- **China May Own More Artificial Intelligence Patents Than US By Year-End**
- **Chinese tech powerhouse Baidu opens Seattle-area office, expanding its reach in AI and the cloud**
- **Chinese scientists can identify you by your walk**
- **China's AI Awakening**
- **PODCAST: The Economist asks: How do you win the AI race?**

China's Plan for World Domination in AI Isn't So Crazy After All

By Mark Bergen and David Ramli

Bloomberg (8/14/2017) - Xu Li's software scans more faces than maybe any on earth. He has the Chinese police to thank.

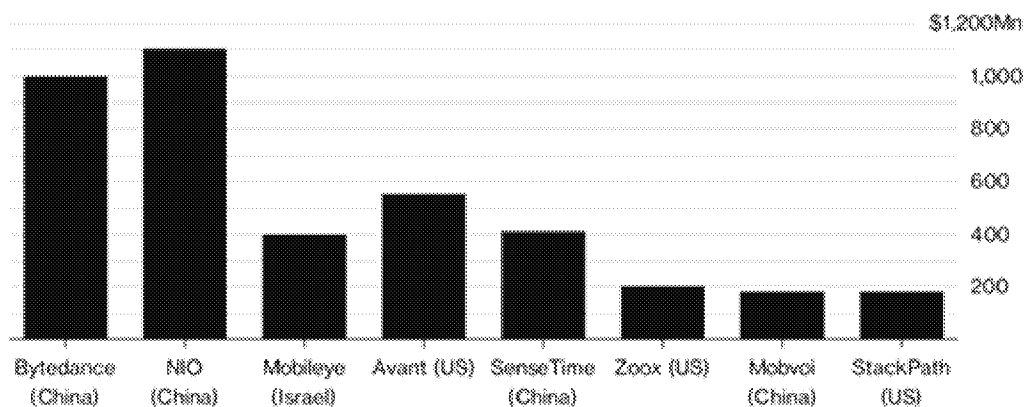
Xu runs SenseTime Group Ltd., which makes artificial intelligence software that recognizes objects and faces, and counts China's biggest smartphone brands as customers. In July, SenseTime raised \$410 million, a sum it said was the largest single round for an AI company to date. That feat may soon be topped, probably by another startup in China.

The nation is betting heavily on AI. Money is pouring in from China's investors, big internet companies and its government, driven by a belief that the technology can remake entire sectors of the economy, as well as national security. A similar effort is underway in the U.S., but in this new global arms race, China has three advantages: A vast pool of engineers to write the software, a massive base of 751 million internet users to test it on, and most importantly staunch government support that includes handing over gobs of citizens' data – something that makes Western officials squirm.

Data is key because that's how AI engineers train and test algorithms to adapt and learn new skills without human programmers intervening. SenseTime built its video analysis software using footage from the police force in Guangzhou, a southern city of 14 million. Most Chinese mega-cities have set up institutes for AI that include some data-sharing arrangements, according to Xu. "In China, the population is huge, so it's much easier to collect the data for whatever use-scenarios you need," he said. "When we talk about data resources, really the largest data source is the government."

Top AI Investments Since 2013

Chinese startups lead the global pack with software and self-driving cars.



Source: CB Insights

Bloomberg

This flood of data will only rise. China just enshrined the pursuit of AI into a kind of national technology constitution. A state plan, issued in July, calls for the nation to become the leader in the industry by 2030. Five years from then, the government claims the AI industry will create 400 billion yuan (\$59 billion) in economic activity. China's tech titans, particularly Tencent Holdings Ltd. and Baidu Inc., are getting on board. And the science is showing up in unexpected places: Shanghai's courts are testing an AI system that scours criminal cases to judge the validity of evidence used by all sides, ostensibly to prevent wrongful prosecutions.

"Data access has always been easier in China, but now people in government, organizations and companies have recognized the value of data," said Jiebo Luo, a computer science professor at the University of Rochester who has researched China. "As long as they can find someone they trust, they are willing to share it."

Every major U.S. tech company is investing deeply as well. Machine learning -- a type of AI that lets driverless cars see, chatbots speak and machines parse scores of financial information -- demands computers learn from raw data instead of hand-cranked programming. Getting access to that data is a permanent slog. China's command-and-control economy, and its thinner privacy concerns, mean that country can dispense video footage, medical records, banking information and other wells of data almost whenever it pleases.

Xu argued this is a global phenomenon. "There's a trend toward making data more public. For example, NHS and Google recently shared some medical image data," he said. But that example does more to illustrate China's edge.

DeepMind, the AI lab of Google's Alphabet Inc., has labored for nearly two years to access medical records from the U.K.'s National Health Service for a diagnostics app. The agency began a trial with the company using 1.6 million patient records. Last month, the top U.K. privacy watchdog declared the trial violates British data-protection laws, throwing its future into question.

Contrast that with how officials handled a project in Fuzhou. Government leaders from that southeastern Chinese city of more than seven million people held an event on June 26. Venture capital firm Sequoia Capital helped organize the event, which included representatives from Dell Inc., International Business Machines Corp. and Lenovo Group Ltd. A spokeswoman for Dell characterized the event as the nation's first "Healthcare and Medical Big Data Ecology Summit."

The summit involved a vast handover of data. At the press conference, city officials shared 80 exabytes worth of heart ultrasound videos, according to one company that participated. With the massive data set, some of the companies were tasked with building an AI tool that could identify heart disease, ideally at rates above medical experts. They were asked to turn it around by the fall.

"The Chinese AI market is moving fast because people are willing to take risks and adopt new technology more quickly in a fast-growing economy," said Chris Nicholson, co-founder of Skymind Inc., one of the companies involved in the event. "AI needs big data, and Chinese regulators are now on the side of making data accessible to accelerate AI."

Representatives from IBM and Lenovo declined to comment. Last month, Lenovo Chief Executive Officer Yang Yuanqing said he will invest \$1 billion into AI research over the next three to four years.

Along with health, finance can be a lucrative business in China. In part, that's because the country has far less stringent privacy regulations and concerns than the West. For decades the government has kept a secret file on nearly everyone in China called a dang'an. The records run the gamut from health reports and school marks to personality assessments and club records. This dossier can often decide a citizen's future -- whether they can score a promotion or be allowed to reside in the city they work.

U.S. companies that partner in China stress that AI efforts, like those in Fuzhou, are for non-military purposes. Luo, the computer science professor, said most national security research efforts are relegated to select university partners. However, one stated goal of the government's national plan is for a greater integration of civilian, academic and military development of AI.

The government also revealed in 2015 that it was building a nationwide database that would score citizens on their trustworthiness, which in turn would feed into their credit ratings. Last year, China Premier Li Keqiang

said 80 percent of the nation's data was in public hands and would be opened to the public, with an unspecified pledge to protect privacy. The raging popularity of live video feeds -- where Chinese internet users spend hours watching daily footage caught by surveillance video -- shows the gulf in privacy concerns between the country and the West. Embraced in China, the security cameras also reel in mountains of valuable data.

Some machine-learning researchers dispel the idea that data can be a panacea. Advanced AI operations, like DeepMind, often rely on "simulated" data, co-founder Demis Hassabis explained during a trip to China in May. DeepMind has used Atari video games to train its systems. Engineers building self-driving car software frequently test it this way, simulating stretches of highway or crashes virtually.

"Sure, there might be data sets you could get access to in China that you couldn't in the U.S.," said Oren Etzioni, director of the Allen Institute for Artificial Intelligence. "But that does not put them in a terrific position vis-a-vis AI. It's still a question of the algorithm, the insights and the research."

Historically, the country has been a lightweight in those regards. It's suffered through a "brain drain," a flight of academics and specialists out of the country. "China currently has a talent shortage when it comes to top tier AI experts," said Connie Chan, a partner at venture capital firm Andreessen Horowitz. "While there have been more deep learning papers published in China than the U.S. since 2016, those papers have not been as influential as those from the U.S. and U.K."

But China is gaining ground. The country is producing more top engineers, who craft AI algorithms for U.S. companies and, increasingly, Chinese ones. Chinese universities and private firms are actively wooing AI researchers from across the globe. Juo, the University of Rochester professor, said top researchers can get offers of \$500,000 or more in annual compensation from U.S. tech companies, while Chinese companies will often double that.

Meanwhile, China's homegrown talent is starting to shine. A popular benchmark in AI research is the ImageNet competition, an annual challenge to devise a visual recognition system with the lowest error rate. Like last year, this year's top winners were dominated by researchers from China, including a team from the Ministry of Public Security's Third Research Institute.

Relentless pollution in metropolises like Beijing and Shanghai has hurt Chinese companies' ability to nab top tech talent. In response, some are opening shop in Silicon Valley. Tencent recently set up an AI research lab in Seattle.

Baidu managed to pull a marquee name from that city. The firm recruited Qi Lu, one of Microsoft's top executives, to return to China to lead the search giant's push into AI. He touted the technology's potential for enhancing China's "national strength" and cited a figure that nearly half of the bountiful academic research on the subject globally has ethnically Chinese authors, using the Mandarin term "huaren" 华人 -- a term for ethnic Chinese that echoes government rhetoric.

"China has structural advantages, because China can acquire more and better data to power AI development," Lu told the cheering crowd of Chinese developers. "We must have the chance to lead the world!"

<https://www.bloomberg.com/news/articles/2017-08-14/china-s-plan-for-world-domination-in-ai-isn-t-so-crazy-after-all>

China introduces pioneer AI Challengers' Games

(People's Daily, 8/15/2017) - The first AI Challengers' International Games were introduced on August 14 by three innovative Chinese companies including Sinovation Ventures, the early stage venture capital firm. Thepaper.cn reported that prizes for the competition are 2 million yuan.

The campaign includes five competitions, namely English-Chinese simultaneous interpretation, English-Chinese machine translation, scene classification, human skeletal system key point detection and image captioning in Chinese.

From September 4, competitors will have free access to massive data including 10 million English-Chinese language pairs, more than 300,000 images with Chinese captions, and so on. The competition lasts till mid-December.

Having free access to massive data was hard to imagine three decades ago. AI Challengers' Games is committed to providing massive datasets and professional guidance by academia and AI industrial experts. Kai-Fu Lee, founder and CEO of Sinovation Ventures, one of the three initiating companies, said they will also help top talents to grow.

Over 10 million yuan will be invested in the next three years to build China's largest datasets for scientific studies and a world-class competition platform. Larger scale high quality datasets will cover various AI industries such as automatic driving, smart healthcare, smart finance and robot.

<http://en.people.cn/n3/2017/0815/c90000-9255579.html>

Baidu's VP Wang Haifeng now leads Baidu Research Institute to further develop its AI application for commercial use

BY Eva Yoo

(Technode, 8/29/2017) - Baidu's vice president, as well as head of Baidu's AI department Wang Haifeng, will serve as director of Baidu Research Institute (in Chinese). With Wang's increased dominance in Baidu's AI arm, Baidu's Artificial Intelligence Group (AIG) will strengthen R&D on the AI application technology for commercial use, including autonomous driving and airport services.

In March this year, AI expert Andrew Ng announced that he's leaving Baidu; at the same time, Baidu's vice president Wang Haifeng was promoted to head of Baidu's AI department, reporting directly to Lu Qi, president of Baidu Group and Chief Operating Officer. This is Wang Haifeng's second promotion this year.

As the person in charge of AI Technology Platform System (AIG), Wang Haifeng will lead Baidu Research Institute (including Depth Learning Laboratory, Big Data Laboratory, Silicon Valley AI Laboratory, Augmented Reality Laboratory), Voice Technology Department, Natural Language Processing Department, Knowledge Map, large data department, and AI platform department.

Baidu's AI technology autonomous driving and airport services

Baidu is working on the “Apollo project” to enable cars to drive autonomously on highways and open city roads by 2020, powered by its face recognition technology and fatigue monitoring to guarantee driving safety. To boost Apollo project, Baidu's voice assistant DuerOS operating system has reportedly partnered with 100 branded consumer appliance partners.

On the other hand, Baidu AI technology's collaboration with aviation services industry is advancing. On August 24th, 2017, Baidu and Beijing Capital International Airport started testing their facial recognition system.

<http://technode.com/2017/08/29/baidus-vp-wang-haifeng-now-leads-baidu-research-institute-develop-ai-application-commercial-use>

The Great US-China Biotechnology and Artificial Intelligence Race

By Mercy A. Kuo

(The Diplomat, 8/23/2017) - *Trans-Pacific View* author Mercy Kuo regularly engages subject-matter experts, policy practitioners, and strategic thinkers across the globe for their diverse insights into the U.S. Asia policy. This conversation with Eleonore Pauwels – Director of Biology Collectives and Senior Program Associate, Science and Technology Innovation Program at the Wilson Center in Washington D.C. – is the 104th in “*The Trans-Pacific View Insight Series.*”

Explain the motivation behind Chinese investment in U.S. genomics and artificial intelligence (AI).

With large public and private investments inland and in the U.S., China plans to become the next AI-Genomics powerhouse, which indicates that these technologies will soon converge in China.

China's ambition is to lead the global market for precision medicine, which necessitates acquiring strategic technological and human capital in both genomics and AI. And the country excels at this game. A sharp blow in this U.S.-China competition happened in 2013 when BGI purchased Complete Genomics, in California, with the intent to build its own advanced genomic sequencing machines, therefore securing a technological knowhow mainly mastered by U.S. producers.

There are significant economic incentives behind China's heavy investment in the increasing convergence of AI and genomics. This golden combination will drive precision medicine to new heights by developing a more sophisticated understanding of how our genomes function, leading to precise, even personalized, cancer therapeutics and preventive diagnostics, such as liquid biopsies. By one estimate, the liquid biopsy market is expected to be worth \$40 billion in 2017.

Assess the implications of iCarbonX of Shenzhen's decision to invest US\$100 million in U.S.-company PatientsLikeMe relative to AI and genomic data collection.

iCarbonX is a pioneer in AI software that learns to recognize useful relationships between large amounts of individuals' biological, medical, behavioral and psychological data. Such a data-ecosystem will deliver insights into how an individual's genome is mutating over time, and therefore critical information about this individual's susceptibilities to rare, chronic and mental illnesses. In 2017, iCarbonX invested \$100 million in PatientsLikeMe, getting a hold over data from the biggest online network of patients with rare and chronic diseases. If successful, this effort could turn into genetic gold, making iCarbonX one of the wealthiest healthcare companies in China and beyond.

The risk factor is that iCarbonX is handling more than personal data, but potentially vulnerable data as the company uses a smartphone application, *Meum*, for customers to consult for health advice. Remember that the Chinese nascent genomics and AI industry relies on cloud computing for genomics data-storage and exchange, creating, in its wake, new vulnerabilities associated with any internet-based technology. This phenomenon has severe implications. How much consideration has been given to privacy and the evolving notion of personal data in this AI-powered health economy? And is our cyberinfrastructure ready to protect such trove of personal health data from hackers and industrial espionage? In this new race, will China and the U.S. have to constantly accelerate their rate of cyber and bio-innovation to be more resilient? Refining our models of genomics data protection will become a critical biosecurity issue.

Why is Chinese access to U.S. genomic data a national security concern?

Genomics and computing research is inherently dual-use, therefore a strategic advantage in a nation's security arsenal.

Using AI systems to understand how the functioning of our genomes impacts our health is of strategic importance for biodefense. This knowledge will lead to increasing developments at the forefront of medical countermeasures, including vaccines, antibiotics, and targeted treatments relying on virus-engineering and microbiome research. Applying deep learning to genomics data-sets could help geneticists learn how to use genome-editing (CRISPR) to efficiently engineer living systems, but also to treat and, even "optimize," human health, with potential applications in military enhancements. A \$15 million partnership between a U.S. company, Gingko Bioworks, and DARPA aims to genetically design new probiotics as a protection for soldiers against a variety of stomach bugs and illnesses.

China could be using the same deep learning techniques on U.S. genomics data to better comprehend how to develop, patent and manufacture tailored cancer immunotherapies in high demand in the United States. Yet, what if Chinese efforts venture into understanding how to impact key genomics health determinants relevant to the U.S. population? Gaining access to increasingly large U.S. genomic data-sets gives China a knowledge advantage into leading the next steps in bio-military research.

Could biomedical data be used to develop bioweapons? Explain.

Personalized medicine advances mean that personalized bio-attacks are increasingly possible. The combination of AI with biomedical data and genome-editing technologies will help us predict genes most important to particular functions. Such insights will contribute to knowing how a particular disease occurs, how a newly-discovered virus has high transmissibility, but also why certain populations and individuals are more susceptible to it. Combining host susceptibility information with pathogenic targeted design, malicious actors could engineer pathogens that are tailored to overcome the immune system or the microbiome of specific populations.

Identify three indicators of where Chinese investment in biotech and AI is headed.

As indicated by the recent success of the company Cirina, a new market heavily invested by China is the one of liquid biopsies, blood tests that can detect biomarkers for certain cancers early. Defining these genetic markers at personal and population levels with statistical rigor requires significant Chinese investments in AI technologies to power comparative studies of unprecedented scale.

Another golden investment for China is more precise molecular therapeutics, with the company WuXi NextCODE leading one of the largest genomic data platforms using machine-learning to better diagnose and treat rare diseases and cancers.

Finally, a company like iCarbonX demonstrates China's interest in leading the personalized medicine market, by using the combination of genomics and AI to provide consumers with preventive genomics and physiological monitoring, increased microbiome insights, as well as lifestyle and diets advices.

Govt set to give AI sector huge policy boost

By Ma Si

China Daily (9/8/2017) - China will unveil a slate of policies, including tax cuts and setting up national artificial intelligence innovation centers, to beef up support for AI and clear legal risks, local media reported.

The Ministry of Industry and Information Technology is teaming up with other ministries and related departments to draft new policies to better cultivate the AI industry, Economic Information Daily reported on Thursday.

Favorable tax policies will be rolled out to encourage small and medium-sized enterprises that are working on AI. More efforts will also be made to open government data and experiment with new ways to tap into data, the report said.

Meanwhile, new policies will be unveiled to channel more resources into AI research, in the hope of advancing innovation capability. More innovation centers will be established to achieve breakthrough, it added.

The intensified efforts to push AI came on the heels of China's ambitious plan to build a 1 trillion yuan (\$147.9 billion) AI core industry by 2030, which is expected to stimulate as much as 10 trillion yuan in related business.

Lu Xi, an official at the Ministry of Industry and Information Technology, said the ministry is leading efforts to draft detailed AI industrialization plans and set up relevant industrial alliances, Economic Information Daily said.

Shanghai, Anhui, Jiangsu and other provinces are also accelerating steps to work on local versions of AI industry policies, it added.

Wu Hequan, an academician from the Chinese Academy of Engineering, said rolling out detailed policies to advance the industrial use of AI is an important way to cultivate an AI ecosystem.

According to Economic Information Daily, new regulations and laws are also in the making to protect privacy and to ensure that legal responsibility will be properly shouldered in the AI age.

A report from consultancy firm PricewaterhouseCoopers forecast that AI will contribute \$15.7 trillion to the global economy in 2030 and China will be among the biggest beneficiaries of that, with a 26 percent boost to its GDP by 2030.

Robin Li, CEO of Baidu Inc, said: "China will lead the world in AI development, since the country has about 700 million internet users who are highly responsive to new technologies. This is an edge no other countries can rival."

Li said in March that the company had invested more than 20 billion yuan (\$3.1 billion) into AI R&D in the past two-and-a-half years. It is now leading the country's first national lab on deep learning, and is ramping up resources to achieve its plan of mass-producing self-driving cars in several years.

http://www.chinadaily.com.cn/business/2017-09/08/content_31712821.htm

China, Russia and the US Are in an Artificial Intelligence Arms Race

“REVOLUTIONARY, NOT MERELY DIFFERENT”

(Futurism, 9/12/2017) - For Russia and Vladimir Putin, it is clear that planetary domination and artificial intelligence (AI) are inextricably intertwined. “Artificial intelligence is the future, not only for Russia but for all humankind,” he said via live video feed as schools started this month. “Whoever becomes the leader in this sphere will become the ruler of the world.”

Putin isn’t an outlier in his thinking; he is simply vocalizing to match the intensity a race that China, Russia, and the US are already running, to acquire smart military power. Each nation has formally recognized the critical importance of intelligent machines to the future of their national security, and each sees AI-related technologies such as autonomous drones and intelligence processing software as tools for augmenting human soldier capital.

“The US, Russia, and China are all in agreement that artificial intelligence will be the key technology underpinning national power in the future,” Gregory C. Allen, Center for a New American Security fellow, told WIRED. He is the coauthor of a recent report, commissioned by the Director of National Intelligence, that concluded: “As with prior transformative military technologies, the national security implications of AI will be revolutionary, not merely different. Governments around the world will consider, and some will enact extraordinary policy measures in response, perhaps as radical as those considered in the early decades of nuclear weapons.”

BECOMING “THE FRONT-RUNNER”

The State Council of China released a detailed strategy in July with the stated goal of making the country “the front-runner and global innovation center in AI” by 2030. Among the policies outlined by the government are pledges to invest in AI and related R&D that will “through AI elevate national defense strength and assure and protect national security.” According to a recent report from Goldman Sachs, China now has most of the drive, government support, and resources it needs to become an AI world power.

China also has the experience of directing its AI inward, to manage its own population — something the US has far less experience with, based on its different style of governance. For example, Chinese authorities are exploring the use of AI technologies, such as facial recognition and predictive analytics, to help prevent crime in advance based on behavioral patterns. This will likely mean that Chinese AI systems have more specialized surveillance experience, and other training that translates well to military applications.

China’s AI strategy also directly connects commercial AI developments to defense applications, another trait influenced by its strong central government. For example, Baidu, China’s leading search engine, runs a national machine learning lab with the operational goal of making China more competitive. Beihang University, a leading military drones center, is also part of China’s machine learning project, and notably the university has been barred by the US Department of Commerce from exporting certain items for reasons of national security.

RUSSIA ON THE RISE

Russia still trails China and the US in the realm of AI. However, the military modernization program they started in 2008 is triggering massive expansions and new investment in AI. The Russian Military Industrial Committee has set a target of making 30 percent of military equipment robotic by 2025. With a smaller tech industry than either China or the US, it needs to set — and achieve — these kinds of ambitious goals to stay competitive. Russia does benefit from a strong academic tradition in technology and science, however, and an efficient deployment of the tech that it already has.

Center for Naval Analyses research analyst Samuel Bendett pointed out to *WIRED* that despite having cheaper drones with shorter ranges, Russia has been able to deploy them very effectively in Ukraine and Syria. Allen added that Russia appears more willing to put AI and machine learning to work as part of its already impressive propaganda, intelligence, social-media, and hacking campaigns. Like China, the Russian government is far more centralized and holds more power over the ways that AI will develop in the country. This suggests that it will probably be directed more toward military and intelligence applications.

AI IN THE US

Although the US has at least so far been generally recognized as the global center for advanced AI development, that development has been almost totally focused in the private sector, and the government has lagged far behind with strategy and R&D. It was not until October of 2016 that the White House released a report on AI, although the Pentagon has been developing its “Third Offset” strategy for several years and monitoring AI and machine learning developments in China in particular.

Yet the US government cannot order the private tech sector to cooperate as the Chinese and Russian governments can, and how much cooperation it receives varies with the political climate. Experts indicate that in some important ways, the US government is behind China and Russia in its use of AI. That’s partially because authoritarian regimes in those countries depend on intelligence, and the ability to detect and eliminate domestic subversion, for survival; they can also apply the technology without regard to privacy or civil rights. And while the American CIA — whose mission is ostensibly foreign, and not domestic — is using AI to collect social mediadata, whose data is up for grabs is a matter of some dispute.

THE BOTTOM LINE

The AI race between China, Russia, and the US is different from any arms race before, in that the technology also has obvious and immediate commercial applications. The same technology that makes Facebook so good at tagging you in photos can help government agencies find suspects and spies. Autonomous cars require the same kinds of technologies that autonomous drones and military land vehicles need. Private companies are in effect conducting military research, whether they intend to or not.

One silver lining from Putin’s fairly ominous speech, however, was his recognition that leveling the AI playing field makes the whole world safer. This is the basic nuclear deterrence argument: if we have nuclear weapons on both sides and our mutual destruction is assured, we won’t use them. As the Allen paper points out, AI will be changing things so fundamentally that population size will no longer be as important for national power; smaller countries that gain an AI edge “will punch far above their weight.”

And perhaps our AIs — if we train them ethically — will themselves see international collaboration and sharing of resources as an optimally advantageous strategy.

<https://futurism.com/china-russia-and-the-us-are-in-an-artificial-intelligence-arms-race/>

China May Own More Artificial Intelligence Patents Than US By Year-End

China Money Network (9/14/2017) - China and the United States are both artificial intelligence superpowers. But China may soon be the clear leader, at least in terms of AI patents filed. The U.S. currently has more, with 35,508 AI patents, versus 34,345 for China. But as Chinese companies and scientists are filing AI patents at a faster pace, the nation is likely to hold more AI patents than the U.S. by year end, according to a report by Sequoia Capital China and Zhen Fund.

The number of AI patents worldwide has been expanding at a compound annual growth rate of 33.2% from 2012 to 2016. Last year, a total 22,774 AI patent applications were submit globally. The U.S. and China dominate, together holding over 50% of all AI patents, followed by Japan, South Korea, Germany, Canada, the U.K., Australia, India and Russia. The ten nations together own 110,393 patents, accounting for 81.5% of all the patents, according to the report.

Each nation has areas of strength. The U.S., for example, owns 32% of global machine learning patents and 26% of natural language processing patents. China comes second with 23% and 14% of patents in these two areas, respectively.

China is particularly strong in machine vision patents, owning 55% of the 150,000 patents in the field globally. Consisting of object recognition and facial recognition, machine vision is useful in industries like public security, healthcare, e-commerce and autonomous driving. Two Chinese facial recognition start-ups, Face++ and SenseTime, have raised significant financing this year and are on China Money Network's China Unicorn List. The U.S. holds 17% of global patents in machine vision.

Technology companies in China and the U.S. have different focuses when it comes to their in-house AI research. American tech companies like IBM, Microsoft and Google are more likely to engage in machine learning, speech recognition and speech synthesis research. China's Tencent, Alibaba and Baidu focus more on imagine recognition, image processing and AI search, according to the report.

Despite the fact that China may soon boast more AI patents than the U.S., the research and development of AI technology requires more than just paper work, warns the report. Chinese companies, it said, still need to work harder and smarter to close the gap between their technology and those of their American peers, especially in fundamental AI research, algorithms and infrastructure.

<https://www.chinamoneynetwork.com/2017/09/14/china-may-hold-artificial-intelligence-patents-us-year-end>

Chinese tech powerhouse Baidu opens Seattle-area office, expanding its reach in AI and the cloud

BY TODD BISHOP

(Geek Wire, 10/9/2017) - China's Baidu is opening an engineering office in the Seattle region, giving the Beijing-based Internet powerhouse an additional U.S. outpost to expand its reach in artificial intelligence and the cloud.

The new Baidu office in downtown Bellevue, Wash., is starting with a small team that includes the leaders of Kitt.ai, the Seattle-based artificial intelligence startup acquired by Baidu this year. Baidu's current space has room for as many as 40 people in the first year, depending on how quickly it's able to recruit top engineers.

"Obviously our core business will continue to be search for many years to come — which is a great business," said Baidu president Ya-Qin Zhang, who established and led Microsoft's China R&D initiatives before joining Baidu. "But we are getting into new fields ... the cloud, autonomous driving and all the verticals that are driven by AI."

Eventually, Baidu could grow to as many as "a couple hundred" people in the region, said Zhang, who oversees the company's U.S. operations, in an interview with GeekWire at the company's new building in Bellevue. That would rival the current size of Baidu's Silicon Valley operations.

Why expand to the Seattle region?

"Talent, talent, talent," said Zhang, citing the region's growing status as a magnet and home for leading computer scientists and engineers, particularly in cloud technologies.

Traded on the Nasdaq at a market value of more than \$85 billion, Baidu is one in a triumvirate of Chinese tech giants that have been growing their clout globally, the group known as "BAT," along with Alibaba and Tencent.

Baidu has serious credentials in artificial intelligence, with more than 2,000 people in its artificial intelligence group. The company has gone through a leadership transition in artificial intelligence this year with the departure in March of its Silicon Valley-based chief scientist, Andrew Ng.

Qi Lu, the respected former Microsoft divisional president with years of artificial intelligence experience, was named Baidu group president and chief operating officer in January, in part to lead a new AI push for the company. In a speech this year, Lu called the promise of artificial intelligence a "historic opportunity."

The experience and reputations of Zhang and Lu promise give Baidu additional connections and clout as the company seeks to recruit top engineers to the new office. Both executives still maintain homes in the Seattle region, and spend time here in addition to working in Beijing at the Baidu headquarters.

Unique aspects of Baidu's culture include the use of a technical committee to evaluate and promote engineers, rather than leaving the decision up to the employee's direct manager. Decisions give weight to technical merit and engineering accomplishments, which Zhang described as an example of the company's engineering culture.

Of course, competition for engineers is fierce among tech companies. With the new office, Baidu becomes the latest in a long string of out-of-town companies to establish engineering centers in the Seattle region, seeking to tap the pool of engineering talent from the University of Washington and top companies headquartered here, including Microsoft and Amazon and many leading startups.

In fact, with the new Baidu office, there are now more than 100 engineering centers established in the Seattle region by out-of-town companies, as tracked by GeekWire on our Engineering Centers list. That database has nearly doubled in size since we launched it on the site less than three years ago.

Several other prominent Chinese tech companies — including Tencent, Huawei and Alibaba — have engineering offices in the region, as well.

Having Baidu join those companies in the Seattle area "makes a ton of sense for them, and it's great for us" as a region, said University of Washington professor Ed Lazowska, the Bill & Melinda Gates Chair at the UW's Paul Allen School of Computer Science and Engineering.

“Seattle’s calling card is serious engineering, not quickie apps,” Lazowska said, calling the region “the world center of the cloud,” with Amazon, Microsoft and a major Google operation in addition to homegrown startups and cloud engineering centers, plus the UW’s focus on software system engineering.

Seattle’s calling card is serious engineering, not quickie apps. He also pointed to the region’s status as a major center of AI, with Microsoft, the UW, the Allen Institute for Artificial Intelligence and others pushing the boundaries of technology in areas such as machine learning, speech, vision, natural language processing, and robotics.

In addition, Seattle’s position on the Pacific Rim gives it a natural connection to Asia. For example, Baidu recently signed on as an industry consortium partner of the Global Innovation Exchange, the U.S.-China technology institute in Bellevue, a first-of-its-kind initiative launched by the UW and China’s Tsinghua University.

Baidu is also sponsoring this week’s GeekWire Summit in Seattle to mark the opening of its new office.

Even with the opening of the new Seattle office, the company is continuing to expand in Silicon Valley, where Baidu just announced a second office focused on AI and autonomous driving. Last month, the company announced a \$1.5 billion “Apollo Fund” to invest in autonomous driving projects over the next three years.

Baidu’s new office also puts the company in closer proximity to Microsoft, which is partnering with Baidu on autonomous driving and intelligent cloud technologies.

As it doubles down on artificial intelligence, Baidu has been narrowing its focus in other areas, selling its food takeout delivery business to Eli.me, a startup backed by Alibaba, for example.

The new Bellevue office is key to Baidu’s long term strategy. Announcing second-quarter results in July, which surpassed analysts’ expectations, Baidu CEO Robin Li said the company will focus on two strategic pillars: mobile technologies and artificial intelligence.

“We will use AI as a fundamental driver to elevate our current core business, specifically our core products of Mobile Baidu, search and feed,” Li said. “In parallel, we will continue to build out our newer AI-enabled initiatives through an open platform and ecosystem approach to capture long term economic opportunity.”

Baidu’s share price has risen more than 50 percent this year amid the new focus on AI. Analysts say it’s critical for the company to find new areas for growth beyond its core search and online marketing businesses. Other initiatives from Baidu include its iQiyi video service, the largest in China, which also continues to grow.

In the recent interview with GeekWire, Zhang said some of the company’s new initiatives such as the Apollo Fund for autonomous driving won’t be revenue sources unto themselves in the short run, but they do set the stage for the company to boost revenue from related services, such as mapping technologies.

Meanwhile, other areas are already seeing significant growth. Baidu Cloud said last month that its customer base increased 10 times in its first year, and revenue increased four times. “We’ll probably continue that trend for the next few years,” said Zhang. “So you will see significant revenue outside of search.”

<https://www.geekwire.com/2017/chinese-tech-powerhouse-baidu-opens-seattle-area-office-expanding-reach-ai-cloud/>

Chinese scientists can identify you by your walk

(ECNS, 10/10/2017) - A new biometric identification technology developed by Chinese scientists allows the identification of people by the way they walk, without the need to look at their faces.

The gait recognition system includes a camera that is functional within a distance of 50 meters from its target and capable of identifying a specific person just by analyzing how they carry themselves, according to researchers from the Automation Institute of the Chinese Academy of Sciences (CAS).

The technology presents multiple advantages.

Huang Yongzhen, an associate researcher from CAS, said technology using iris recognition needs its target to be no further than 30 cm from the lens, while face recognition technology can work at a distance of up to five meters. But the newly-developed system can operate within a much longer range, and at faster speeds.

Detection time is reduced to less than 200 milliseconds, faster than the time it takes an eye to blink (between 300 to 400 milliseconds).

The new technology can also identify a person without their active cooperation. Even if they walk past the surveillance camera hiding their face, gait recognition algorithm can still unveil their identity.

Gait recognition can also estimate the density of large populations, as it incorporates real-time people counting technology. It is able to detect up to 1,000 people within an area of 1,000 square meters. The technique could be widely used in the fields of security and public transport, among others.

China is currently at the forefront of gait recognition technology worldwide, CAS has said.

<http://www.ecns.cn/2017/10-10/276456.shtml>

China's AI Awakening

中国人工智能的崛起

By Will Knight

MIT Technology Review (10/10/2017) - On a tropical island that marks the southern tip of China, a computer program called Lengpudashi is playing one-on-one poker against a dozen people at once, and it's absolutely crushing them. Lengpudashi, which means "cold poker master" in Mandarin, is using a new artificial-intelligence technique to outbet and outbluff its opponents in a two-player version of Texas hold 'em.

The venue for the tournament is a modern-looking technology park in Haikou, capital of the island of Hainan. Outside, modern high-rises loom over aging neighborhoods. Those gathered to play the machine include several poker champs, some well-known Chinese investors, entrepreneurs, and CEOs, and even the odd television celebrity. The games are being broadcast online, and millions are watching. The event symbolizes a growing sense of excitement and enthusiasm for artificial intelligence in China, but there's also a problem. Lengpudashi wasn't made in Hainan, Beijing, or Shanghai; it was built in Pittsburgh, U.S.A.

For many in China, this simply won't do. The country is now embarking on an unprecedented effort to master artificial intelligence. Its government is planning to pour hundreds of billions of yuan (tens of billions of dollars) into the technology in coming years, and companies are investing heavily in nurturing and developing

AI talent. If this country-wide effort succeeds—and there are many signs it will—China could emerge as a leading force in AI, improving the productivity of its industries and helping it become leader in creating new businesses that leverage the technology. And if, as many believe, AI is the key to future growth, China's prowess in the field will help fortify its position as the dominant economic power in the world.

Indeed, the country's political and business leaders are betting that AI can jump-start its economy. In recent decades, a booming manufacturing sector—and market reforms encouraging foreign trade and investment—have helped bring hundreds of millions of people out of poverty, creating business empires and transforming Chinese society. But manufacturing growth is slowing, and the country is looking toward a future built around advanced technology (see “[China Is Building a Robot Army of Model Workers](#)”). Applying artificial intelligence may be the next step in this technology-fueled economic miracle. While many in the West fret about AI eliminating jobs and worsening wealth and income inequality, China seems to believe it can bring about precisely the opposite outcomes.

China's AI push includes an extraordinary commitment from the government, which recently announced a sweeping vision for AI ascendancy. The plan calls for homegrown AI to match that developed in the West within three years, for China's researchers to be making “major breakthroughs” by 2025, and for Chinese AI to be the envy of the world by 2030.

There are good reasons to believe the country can make this vision real. In the early 2000s, the government said it wanted to build a high-speed rail network that would spur technological development and improve the country's transportation system. This train network is now the most advanced in the world. “When the Chinese government announces a plan like this, it has significant implications for the country and the economy,” says [Andrew Ng](#), a prominent AI expert who previously oversaw AI technology and strategy at China's biggest online search company, Baidu. “It's a very strong signal to everyone that things will happen.”

The government's call to action will accelerate what has already begun to happen. The country's tech companies, led by the Internet giants Baidu, Alibaba, and Tencent, are hiring scores of AI experts, building new research centers, and investing in data centers that rival anything operated by Amazon, Google, or Microsoft. Money is also pouring into countless startups as Chinese entrepreneurs and investors spy a huge opportunity to harness AI in different industries.

China has some big advantages in AI. It has a wealth of talented engineers and scientists, for one. It also is rich in the data necessary to train AI systems. With fewer obstacles to data collection and use, China is amassing huge databases that don't exist in other countries. The results can be seen in the growth of facial-recognition systems based on machine learning: they now identify workers at offices and customers in stores, and they authenticate users of mobile apps.

The nationwide interest in the [poker tournament](#) in Hainan reflects China's appetite for the latest artificial-intelligence breakthroughs. Mastering even a two-player form of poker is a significant achievement for AI because, unlike many other games, poker requires players to act with limited information, and to sow uncertainty by behaving unpredictably. An optimal strategy therefore requires both careful and instinctive judgment, which are not easy qualities to give a machine. Lengpudashi impressively solved the problem by using a brilliant new game-theory algorithm, which could be very useful in many other scenarios, including financial trading and business negotiations. But Lengpudashi has received far less attention in its home country than it has in Hainan.

To explore China's AI revolution and its implications, I've traveled to the heart of this boom and met with many of the key researchers, entrepreneurs, and executives. From China's bustling capital to its factory-filled south, and from an ambitious new research center to a billion-dollar startup, one thing is clear: artificial

intelligence may have been invented in the West, but you can see its future taking shape on the other side of the world.

看东方

Look east

My journey begins at MIT, one of the wellsprings of artificial intelligence. Kai-Fu Lee, a well-known Chinese AI expert and investor and one of the organizers of the Hainan tournament, has come to recruit students for a new AI institute that his company, Sinovation Ventures, is building in Beijing.

Lee gives a talk entirely in Mandarin to an auditorium packed with about 300 Chinese students. He is dressed impeccably, in an expensive-looking suit and dress shirt, and he speaks in a confident, soothing tone. The talk touches on the interwoven trends that have driven the recent rise in machine intelligence: more powerful computers, ingenious new algorithms, and huge quantities of data. He argues that China is perfectly poised to take advantage of these advances.

“The U.S. and Canada have the best AI researchers in the world, but China has hundreds of people who are good, and way more data,” he tells the audience. “AI is an area where you need to evolve the algorithm and the data together; a large amount of data makes a large amount of difference.”

In 1998 Lee founded Microsoft’s Beijing research lab, which showcased the country’s exciting talent pool (see “An Age of Ambition”). Then, in 2005, he became the founding president of Google China. Lee is now famous for mentoring young entrepreneurs, and he has more than 50 million followers on the Chinese microblogging platform Sina Weibo.

In the audience are exactly the type of prized students who would normally flock to Silicon Valley. But many are clearly taken by Lee’s message of opportunities in China. The crowd hangs on his every word, and some people clamor for autographs afterward. “Today the U.S. has a technology leadership,” Lee tells me later. “But China has a tremendous amount of potential.”

To see what this potential looks like up close, I travel to Lee’s new institute, half a world away from MIT, in Beijing’s Haidian district. The streets outside are filled with people on colorful ride-sharing bikes. I pass lots of fashionable-looking young techies as well as people delivering breakfast—ordered via smartphone, no doubt—to busy workers. At the time of my visit, a major AI event is taking place a few hundred miles to the south in Wuzhen, a picturesque town of waterways. AlphaGo, a program developed by researchers at the Alphabet subsidiary DeepMind, is playing the ancient board game Go against several top Chinese players, including the world’s number one, Ke Jie. And it’s soundly beating them.

AlphaGo’s victories in Wuzhen are followed closely in the Chinese capital. As I enter Sinovation’s institute, in fact, I notice a Go board on which engineers are testing out the moves made during some of the matches.

The location of the institute is well chosen. From the office windows, you can see the campuses of both Peking University and Tsinghua University, two of China’s top academic institutions. Sinovation provides machine-learning tools and data sets to train Chinese engineers, and it offers expertise for companies hoping to make use of AI. The institute has about 30 full-time employees so far, but the plan is to employ more than 100 by next year, and to train hundreds of AI experts each year through internships and boot camps. Right now, roughly 80 percent of the institute’s funding and projects are aimed at commercializing AI, while the rest is focused on more far-out technology research and startup incubation.

The goal isn't to invent the next AlphaGo, though; it's to upgrade thousands of companies across China using AI. Lee says many Chinese businesses, including the big state-owned enterprises, are technologically backward and ripe for overhaul, but they lack any AI expertise themselves. Needless to say, this presents an enormous opportunity.

人工智能无处不在 AI everywhere

Across the capital, in fact, I notice a remarkable amount of interest in artificial intelligence. In one restaurant, for instance, I find a machine that takes my picture and then supposedly uses AI to determine how healthy I am. This seems completely impossible, but the machine says I'm in great shape before suggesting that I have plenty to eat.

This fascination with the technology is reflected in Beijing's feverish startup scene, which is already producing some formidable AI companies. One of them is SenseTime, which was founded in 2014 and is already among the world's most valuable AI startups. Launched by researchers from the Chinese University of Hong Kong, SenseTime provides computer-vision technology to big Chinese companies, including the state-owned cellular provider China Mobile and the online retail giant JD.com. The company is now studying markets such as automotive systems. This July, SenseTime raised \$410 million in funding, giving it a valuation of \$1.5 billion. The entrance to SenseTime's office features several large screens fitted with cameras. One can automatically add augmented-reality effects to a person's face. Snapchat and Instagram offer similar gimmicks, but this one can also add effects in response to hand and body movements as well as smiles or winks.

Qing Luan, director of SenseTime's augmented-reality group, previously developed office apps for Microsoft in Redmond, Washington. She says she returned to China because the opportunities just seemed much bigger. "We were struggling to get a thousand users; then I talked with my friend who was working at a startup in China, and she said, 'Oh, a million users is nothing—we get that in several days,'" she recalls.

Earlier this year SenseTime's engineers developed a novel image-processing technique for automatically removing smog and rain from photographs, and another for tracking full-body motion using a single camera. Last year they were part of a team that won a prestigious international computer-vision award.

Xiaoou Tang, SenseTime's founder and a professor at the Chinese University of Hong Kong, is wearing a suede jacket, slacks, and glasses, and he has an intense air about him. He seems fiercely proud of his company's achievements. Tang explains that the company's name comes from a phonetic transcription of the name of the Shang dynasty and of its first ruler, Tang. This era, beginning around 1600 bce, was a critical age of development for the country. "China was leading the world then," Tang says with a smile. "And in the future, we will lead again with technological innovations."

智能制造 Manufacturing intelligence

In the United States and other Western nations, many large sectors, such as manufacturing and services, have been slow to invest in AI and change their business practices. In China, there appears to be a greater sense of urgency about adapting to the changing technology. Across just about every industry, Chinese companies are shrugging off their reputation for following Western businesses, and investing heavily in research and development. Ng, who previously led Baidu's AI effort, says China's business leaders understand better than most the need to embrace new trends. "The titans of industry [in China] have seen fortunes made and fortunes

lost all within their lifetime,” he says. “When you see the tech trends shift, you had better move quickly, or someone else will beat you.”

Baidu anticipated the potential of artificial intelligence and sought to leverage it to reinvent its whole business. In 2014, the company created a lab dedicated to applying deep learning across its business, and in recent years, its researchers have made some significant advances. When Microsoft developed a system capable of better-than-human performance in speech recognition last year, for instance, few Western reporters realized that Baidu had done that a year earlier.

Following Baidu’s example, other Chinese tech companies are also looking to reinvent themselves with AI. The Internet leader Tencent, headquartered in the city of Shenzhen, is among them.

Shenzhen is nestled next to Hong Kong in southern China. Approaching by air, I see an armada of cargo ships moored in the South China Sea. In 1980, when Shenzhen was a small market town, it was designated China’s first Special Economic Zone, granting it unprecedented economic and regulatory freedoms. Manufacturing empires were built on the backs of migrant workers producing every imaginable product, and the population rose from 30,000 to more than 11 million. In recent years, the city has reflected China’s technological progress, and it is now home to global technology companies including the networking giant Huawei, the smartphone maker ZTE, and the electric-car company BYD.

The city’s main strip is lined with palm trees, gaudy hotels, and busy bars and restaurants. Tencent’s headquarters, in Nanshan district, spans several large buildings, and the entrance is as busy as a subway station. Stepping inside, out of stifling humidity, I begin a tour that touts Tencent’s history and achievements. And it shows that you don’t have to be first in a technology to have a big impact. In 2011, the company launched a simple messaging app, modeled on products already found in the U.S. This would evolve into WeChat, an innovative mobile platform that now supports social networking, news, games, and mobile payments. With 889 million daily active users, WeChat now has an incredible grip on China’s Internet market.

Although Tencent created an AI lab only last year, it has hired scores of researchers and opened an outpost in Seattle. The company’s researchers have already copied AI innovations from the West, including DeepMind’s AlphaGo. Tencent’s AI lab is led by Tong Zhang, a quiet man with thin glasses and a round face, who previously worked at Baidu’s AI lab and before that was a professor at Rutgers University. Zhang speaks quietly, usually after a careful pause. He explains that AI will be crucial to Tencent’s plans to grow, especially outside China. “AI is important for the next phase,” he says. “At a certain stage, you just cannot copy things. You need your own capabilities.”

I ask him if Tencent might be planning some spectacular demonstrations of AI, something like AlphaGo or Lengpudashi. Tencent owns several very popular games, including the strategy title League of Legends, which is played by more than 100 million people every month. Like Go, it requires instinctive actions, and like poker, it involves playing without a clear picture of your opponents’ standing. But it also requires planning far ahead, so it would be a worthy game for AI researchers to tackle next. “Right now, we have a bunch of small projects—some are more adventurous,” is all Zhang will say.

Tencent’s AI goals may in fact be more practical. The company has an amazing amount of conversation data thanks to WeChat and another messaging platform, called QQ. This data might be used to train machine-learning systems to hold more meaningful conversations. Making advances in language could have countless practical applications, from better document analysis and search to much smarter personal assistants. “The challenge, and also the opportunity, will be in natural language,” Zhang says.

宏伟蓝图

Think big

It might be unnerving for Western nations to see a newcomer mastering an important technology, especially when the full potential of that technology remains uncertain. But it is wrong to view this story simply in terms of competition with the West.

A big problem facing both the U.S. and China is slowing economic growth. While AI may eliminate certain jobs, it also has the potential to greatly expand the economy and create wealth by making many industries far more efficient and productive. China has embraced that simple fact more eagerly and more completely than many Western nations. But there's no reason why China's AI-fueled economic progress should come at the expense of other countries, if those countries embrace the same technology just as keenly.

China might have unparalleled resources and enormous untapped potential, but the West has world-leading expertise and a strong research culture. Rather than worry about China's progress, it would be wise for Western nations to focus on their existing strengths, investing heavily in research and education. The risk is missing out on an incredibly important technological shift. Yes, companies like Google and Facebook are making important strides in AI today, but this isn't enough to reboot a whole economy. Despite the fanfare around AI, there are few economic signs—such as increased productivity—that most of the economy is taking advantage of the technology yet. Large segments of the economy beyond Silicon Valley, like medicine, service industries, and manufacturing, also need to sign on.

I can't help thinking of the poker tournament in Hainan and reflecting that the rest of the world should take inspiration from Lengpudashi, the poker-playing AI. It's time to follow China's lead and go all in on artificial intelligence.

<https://www.technologyreview.com/s/609038/chinas-ai-awakening/>

PODCAST: The Economist asks: How do you win the AI race? (8/3/2017)

The hosts speak with Sequoia China's Neil Shen

- <https://www.acast.com/theeconomistasks/theeconomistasks-howdoyouwintheairace->

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